

ELEVENTH WEEK.

Chart work.—Average number of rainy days for the year.
Normal relative humidity.

Lecture.—What is meant by "relative humidity;" how humidity observations are made.

TWELFTH WEEK.

Chart work.—Average seasonal snowfall and average cloudiness.

Lecture.—How snowfall is measured; water equivalent to snow; importance of snowfall in subarid regions; extent to which a covering of snow protects the ground from frost.

THIRTEENTH WEEK.

Chart work.—Average dates of first and last killing frosts.

Lecture.—How frost is formed; methods of protection from frost.

FOURTEENTH WEEK.

Lecture.—Comparison of temperature and rainfall of the United States with that of other countries of the globe, illustrated by charts.

At Buffalo, N. Y., on January 8 and 10, the class in physics from the local high school, and on January 25 the physical geography class from the high school at North Tonawanda, N. Y., visited the Weather Bureau office. The theory and use of the various meteorological instruments, the construction of weather maps, and other features of the work of the office were explained to the students by Local Forecaster David Cuthbertson, who considers these official visits of more practical value to the students than formal lectures at the school.

At Indianapolis, Ind., on January 11, the physical geography class of the Shortridge High School, and on January 23 the pupils of grade 8A, from public school No. 8, visited the Weather Bureau office. Section Director W. T. Blythe explained the various meteorological instruments, and the manner in which observations are made, collected, and charted, so as to be available for forecast and study purposes.

Mr. F. H. Clarke, Local Forecast Official, Scranton, Pa., reports that he has delivered addresses before farmers institutes in Pennsylvania, as follows: December 5, 1901, at Mont-

rose, Susquehanna County; December 6, 1901, at Madisonville, Lackawanna County; December 7, 1901, at Clarks Summit, Lackawanna County; December 13, 1901, Factoryville, Wyoming County; December 20, 1901, at Waymart, Wayne County; January 6, 1902, at Weatherly, Carbon County; and on January 11, 1902, at Sciota, Monroe County.

Mr. Clarke outlined very briefly the method by which weather information is collected for use at the various Weather Bureau offices in making daily forecasts, and urged upon the farmers the importance of keeping a record of local weather signs, or changes in wind direction, cloud forms, etc., that precede changes in the weather, to supplement the forecast issued by the Weather Bureau.

Mr. J. Warren Smith, Section Director, Columbus, Ohio, delivered an address, illustrated with stereopticon views, in the auditorium of the high school, Mount Vernon, Ohio, on January 24. The account of the lecture that appeared in the Mount Vernon Daily Banner of January 25 indicates that Mr. Smith covered a wide field in his lecture, "Mountain meteorology," "Meteorology in the arctic regions," and "The sections of the globe having the highest and lowest temperature" being discussed, as well as the instruments and methods employed by the United States Weather Bureau in its work. The conditions that produce thunderstorms, tornadoes, rain, snow, and hail were also explained, and the destructive effects of hurricane winds were shown by means of views.

Mr. Charles Stuart, Observer, Spokane, Wash., lectured before the faculty and students of the Washington State Agricultural College at Pullman, on January 29, on "Weather changes and their causes." A barometer was exhibited and explained.

Mr. Charles E. Linney, Observer, Chicago, Ill., spoke before the Cook County Farmers Institute at Chicago Heights on January 31, his subject being "The Weather Bureau and how to use it." The history of the development of the Weather Bureau was outlined, the various phases of its forecast work explained, and also the manner in which these forecasts could be made most useful. Charts were used showing the development and progress of typical storm areas, and a few meteorological instruments were displayed.—H. H. K.

THE WEATHER OF THE MONTH.

By Prof. ALFRED J. HENRY, in charge of Division of Records and Meteorological Data.

CHARACTERISTICS OF THE WEATHER FOR JANUARY.

From the 1st to the 20th mild, pleasant weather prevailed; thereafter, especially during the closing days of the month, much rain, sleet or snow, and stormy weather were experienced in the lower Mississippi and lower Ohio valleys and generally east of the Appalachians.

The month, as a whole, may be characterized as warm and dry, there being but two important exceptions, viz, (1) the temperature was below the average in Florida, the east Gulf, and South Atlantic States, and (2) the precipitation was above the seasonal average in Arkansas, Kentucky, and locally in the lower Lake region.

There were no unusually severe cold waves.

In connection with the general character of the weather of the month, attention is called to the fact that from the 1st to the 20th the lows moved across the country along the north-

ern boundary, and that pressure over the interior and southern districts was relatively high. It has been noticed in previous years that mild, pleasant weather is almost invariably associated with high pressure to the southward and a movement of lows along the northern circuit. It is not often, however, that such a condition persists as long as three weeks. This type, if we may call it such, was followed on the 19th by a southerly type, and the latter persisted until the end of the month.

PRESSURE.

The distribution of monthly mean pressure is shown graphically on Chart IV and the numerical values are given in Tables I and VI.

Chart III presents for the first time the monthly mean values reduced to sea level under the Bigelow system of reductions, which went into effect on January 1, 1902. The important feature on Chart IV is the great ridge of high pressure extending northwestward from the south Atlantic coast to the

coasts of Washington and Oregon. In a normal month this ridge is broken in the Mississippi and lower Missouri valleys, nor does it extend so far to the northwestward over the coasts of Washington and Oregon as in the current month.

As compared with normal pressures, computed under the new system, pressure during the current month was above normal in all the districts save the Canadian Maritime Provinces, southern California, and southwestern Arizona. The most pronounced departures from the normal occurred in British Columbia and thence southeastward to Wyoming and Colorado. Over this area mean pressure ranged from 0.12 to 0.20 inch above the seasonal average.

TEMPERATURE OF THE AIR.

The distribution of monthly mean surface temperature, as deduced from the records of about 1,000 stations, is shown on Chart VI.

Along the Atlantic coast from southern New York to Florida, and generally east of the Appalachians and in the lower Mississippi Valley, temperature ranged from less than a degree to 3° below the January normal. Temperature was also below normal in middle California; elsewhere the temperature was above the seasonal average by amounts varying from a few degrees in the Southwest to 15° in the Saskatchewan Valley. Generally, throughout the upper Mississippi and Missouri valleys, temperature was from 8° to 10° above the seasonal average.

Maximum temperatures of 80° and over were recorded in Florida, southern Texas, Arizona, and southern California. In the interior of the continent north of the Lake region the maximum temperature of the month barely exceeded 32°. The line of zero temperatures for January, 1902, was a trifle farther south than in the corresponding month of 1901. Freezing temperatures were recorded as far south as Tampa and generally along the Gulf coast, except in southern Louisiana. The lowest temperatures of the month were recorded in the mountain regions of Wyoming.

The average temperature for the several geographic districts and the departures from the normal values are shown in the following table:

Average temperatures and departures from normal.

| Districts. | Number of stations. | Average temperatures for the current month. | Departures for the current month. | Accumulated departures since January 1. | Average departures since January 1. |
|---------------------------|---------------------|---|-----------------------------------|---|-------------------------------------|
| New England | 8 | 24.6 | -1.0 | ..... | ..... |
| Middle Atlantic | 12 | 30.5 | -2.0 | ..... | ..... |
| South Atlantic | 10 | 43.9 | -2.7 | ..... | ..... |
| Florida Peninsula | 8 | 57.4 | -2.4 | ..... | ..... |
| East Gulf | 9 | 48.3 | -1.5 | ..... | ..... |
| West Gulf | 7 | 46.4 | -0.2 | ..... | ..... |
| Ohio Valley and Tennessee | 11 | 33.6 | -0.7 | ..... | ..... |
| Lower Lake | 8 | 24.9 | -0.4 | ..... | ..... |
| Upper Lake | 10 | 20.9 | +3.3 | ..... | ..... |
| North Dakota | 8 | 13.4 | +8.7 | ..... | ..... |
| Upper Mississippi Valley | 11 | 25.4 | +4.3 | ..... | ..... |
| Missouri Valley | 11 | 26.4 | +5.9 | ..... | ..... |
| Northern Slope | 7 | 23.3 | +5.8 | ..... | ..... |
| Middle Slope | 6 | 30.8 | +1.8 | ..... | ..... |
| Southern Slope | 6 | 39.5 | +1.2 | ..... | ..... |
| Southern Plateau | 13 | 38.5 | +2.2 | ..... | ..... |
| Middle Plateau | 9 | 25.1 | +1.6 | ..... | ..... |
| Northern Plateau | 12 | 26.9 | +1.8 | ..... | ..... |
| North Pacific | 7 | 39.5 | +0.6 | ..... | ..... |
| Middle Pacific | 5 | 45.9 | -1.2 | ..... | ..... |
| South Pacific | 4 | 52.1 | +1.6 | ..... | ..... |

In Canada.—Prof. R. F. Stupart says:

The temperature was about 2° below the average over the greater portion of British Columbia, and 1° to 2° below in the extreme southern portion of Ontario; elsewhere throughout Canada it was above the average, exceptionally so from the Rocky Mountains to Lake Superior and well

above in the Maritime Provinces. The excess amounted to from 9° to 14° in the Territories and Manitoba and from 3° to 5° in the Maritime Provinces.

PRECIPITATION.

The month as a whole was unusually dry. In very few districts did the precipitation equal or exceed the average. Less than an inch of rain fell over the greater portion of Florida, southern Georgia, and the southern portion of South Carolina. The deficiency in the Gulf States was equally marked. The only regions in which there was an excess of precipitation are northern Arkansas, Kentucky, the southern portion of West Virginia, and the extreme western part of New York State. On the Pacific coast less than half the normal amount of precipitation was recorded.

Average precipitation and departure from the normal.

| Districts. | Number of stations. | Average. | | Departure. | |
|---------------------------|---------------------|----------------|-----------------------|----------------|---------------------------|
| | | Current month. | Percentage of normal. | Current month. | Accumulated since Jan. 1. |
| | | Inches. | | Inches. | Inches. |
| New England | 8 | 2.26 | 56 | -1.8 | ..... |
| Middle Atlantic | 12 | 2.58 | 72 | -1.0 | ..... |
| South Atlantic | 10 | 1.68 | 37 | -2.7 | ..... |
| Florida Peninsula | 8 | 0.50 | 18 | -2.3 | ..... |
| East Gulf | 9 | 2.29 | 44 | -2.9 | ..... |
| West Gulf | 7 | 2.35 | 68 | -1.1 | ..... |
| Ohio Valley and Tennessee | 11 | 3.24 | 76 | -1.0 | ..... |
| Lower Lake | 8 | 1.75 | 66 | -0.9 | ..... |
| Upper Lake | 10 | 0.75 | 37 | -1.3 | ..... |
| North Dakota | 8 | 0.21 | 34 | -0.4 | ..... |
| Upper Mississippi Valley | 11 | 0.97 | 55 | -0.8 | ..... |
| Missouri Valley | 11 | 0.81 | 80 | -0.2 | ..... |
| Northern Slope | 7 | 0.20 | 29 | -0.5 | ..... |
| Middle Slope | 6 | 0.36 | 42 | -0.5 | ..... |
| Southern Slope | 6 | 0.13 | 14 | -0.8 | ..... |
| Southern Plateau | 13 | 0.69 | 58 | -0.5 | ..... |
| Middle Plateau | 8 | 0.54 | 47 | -0.6 | ..... |
| Northern Plateau | 12 | 0.89 | 42 | -1.2 | ..... |
| North Pacific | 7 | 5.53 | 67 | -2.7 | ..... |
| Middle Pacific | 5 | 1.53 | 28 | -3.9 | ..... |
| South Pacific | 4 | 1.30 | 48 | -1.4 | ..... |

In Canada.—Professor Stupart says:

The precipitation was largely below the average in all parts of Canada, except in the lower mainland of British Columbia, the Niagara Peninsula, and east and northeast Ontario, where it was generally above the average, and in Western Assiniboia and portions of the Lake Superior region where it was only slightly above the average. The deficiency was from an inch to two and a half inches over the greater portion of British Columbia and Ontario and throughout the Maritime Provinces, nearly an inch below in Quebec, and about half an inch below in the Territories and Manitoba. At the end of the month the whole Dominion, except the Maritime Provinces, was snow covered, the southern portion of Vancouver Island and the lower mainland of British Columbia not excepted, which is unusual; however, the amount was nowhere considerable, except in Ontario and Quebec, and in the former province there was very little snow south and west of the Georgian Bay and Lake Ontario, respectively. This was owing to the fact that the only heavy snowfall of the month did not extend very far west of Lake Ontario or north of Lake Simcoe. Ottawa recorded 30 inches on the ground at the close of the month, Quebec, 25 inches, and Father Point, 35 inches.

SLEET.

The following are the dates on which sleet fell in the respective States:

Alabama, 5, 21, 26, 27, 28, 29, 31. Arizona, 24, 27, 28, 29. Arkansas, 2, 3, 4, 5, 6, 18, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31. Colorado, 3. Connecticut, 2, 10, 19, 21, 26, 27. Delaware, 30, 31. District of Columbia, 29, 30. Florida, 5. Georgia, 18, 20, 21, 27, 28, 29. Idaho, 3. Illinois, 18, 20, 21, 25, 26, 27, 28, 29, 30, 31. Indiana, 18, 24, 25, 26, 27, 28, 29, 30, 31. Indian Territory, 4, 25, 26, 28, 29, 30, 31. Iowa, 4, 20, 25. Kansas, 19, 20, 21, 23, 25, 28. Kentucky, 25, 26, 27, 28, 29, 30, 31. Louisiana, 4, 5, 27, 28, 29. Maine, 27. Maryland, 7, 21, 25, 26, 27, 29, 30, 31. Massachusetts, 2, 3. Michigan, 6, 9, 10, 27. Minnesota, 4, 5. Mississippi, 3, 4, 5, 20, 26, 27, 28, 29, 30, 31. Missouri, 19, 20, 21, 22, 24, 25,

26, 27, 28, 29, 30, 31. Nebraska, 2, 20, 25, 29. Nevada, 2, 16, 21, 23, 24, 25, 27. New Jersey, 3, 8, 11, 18, 19, 21, 22, 29, 30. New Mexico, 12, 27. New York, 10, 18, 21, 22, 23, 26, 27. North Carolina, 11, 16, 20, 21, 27, 28, 29, 30, 31. Ohio, 26, 27, 29, 30. Oklahoma, 4, 24, 25, 26, 27, 28, 29, 31. Oregon, 4, 18, 19, 24, 25, 31. Pennsylvania, 19, 21, 22, 25, 26, 28, 29, 30, 31. South Carolina, 20, 21, 27, 28, 29. Tennessee, 20, 21, 22, 24, 27, 28, 29, 30. Texas, 14, 17, 20, 25, 26, 27, 28, 29, 30. Utah, 2, 16, 17, 19, 28. Vermont, 21. Virginia, 18, 21, 24, 25, 28, 29, 30, 31. Washington, 1, 3, 5, 8, 17, 31. West Virginia, 21, 22, 23, 26, 27, 28, 29, 30, 31. Wisconsin, 5. Wyoming, 2.

HAIL.

The following are the dates on which hail fell in the respective States:

Arizona, 19, 25, 26, 27, 28. California, 29. New Mexico, 11. Oregon, 4, 24, 30, 31. Washington, 8.

HUMIDITY.

The average by districts appear in the subjoined table:

Average relative humidity and departures from the normal.

| Districts. | Average. | Departure from the normal. | Districts. | Average. | Departure from the normal. |
|---------------------------------|----------|----------------------------|------------------------|----------|----------------------------|
| New England | 74 | -12 | Missouri Valley | 74 | -4 |
| Middle Atlantic | 73 | -12 | Northern Slope | 76 | +6 |
| South Atlantic | 73 | -5 | Middle Slope | 68 | +1 |
| Florida Peninsula | 82 | 0 | Southern Slope | 56 | -8 |
| East Gulf | 73 | -5 | Southern Plateau | 43 | -8 |
| West Gulf | 75 | 0 | Middle Plateau | 69 | 0 |
| Ohio Valley and Tennessee | 75 | -12 | Northern Plateau | 82 | +1 |
| Lower Lake | 78 | -3 | North Pacific | 86 | -1 |
| Upper Lake | 80 | -12 | Middle Pacific | 75 | -6 |
| North Dakota | 78 | -3 | South Pacific | 66 | -8 |
| Upper Mississippi Valley | 76 | -2 | | | |

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IV, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 100 thunderstorms were received during the current month as against 210 in 1901 and 336 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 21st, 14; 26th, 15; 31st, 13.

Reports were most numerous from: Arkansas, 12; Alabama, 9. *Auroras.*—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz: 19th to 27th.

In Canada: Auroras were reported at Toronto, 16th; Minnedosa, 17th; Battleford, 4th, 7th.

SUNSHINE AND CLOUDINESS.

The distribution of sunshine is graphically shown on Chart VII, and the numerical values of average daylight cloudiness, both for individual stations and by geographical districts, appear in Table I.

The averages for the various districts, with departures from the normal, are shown in the table below:

Average cloudiness and departures from the normal.

| Districts. | Average. | Departure from the normal. | Districts. | Average. | Departure from the normal. |
|---------------------------------|----------|----------------------------|------------------------|----------|----------------------------|
| New England | 5.6 | -0.2 | Missouri Valley | 4.2 | -0.9 |
| Middle Atlantic | 6.1 | +0.5 | Northern Slope | 4.2 | -0.4 |
| South Atlantic | 4.7 | -0.6 | Middle Slope | 3.9 | +0.1 |
| Florida Peninsula | 4.3 | -0.5 | Southern Slope | 4.6 | +0.8 |
| East Gulf | 5.5 | -0.1 | Southern Plateau | 3.5 | +0.6 |
| West Gulf | 5.5 | +0.1 | Middle Plateau | 5.0 | +0.2 |
| Ohio Valley and Tennessee | 5.2 | -0.5 | Northern Plateau | 6.6 | -0.7 |
| Lower Lake | 7.2 | -0.3 | North Pacific | 7.0 | -0.1 |
| Upper Lake | 6.6 | -0.2 | Middle Pacific | 5.4 | +0.3 |
| North Dakota | 3.8 | -0.9 | South Pacific | 4.7 | +0.6 |
| Upper Mississippi Valley | 4.5 | -0.8 | | | |

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

| Stations. | Date. | Velocity. | Direction. | Stations. | Date. | Velocity. | Direction. |
|----------------------------|-------|-----------|------------|------------------------------|-------|-----------|------------|
| Amarillo, Tex. | 17 | 50 | w. | Neah Bay, Wash. | 24 | 54 | e. |
| Do. | 20 | 57 | nw. | New York, N. Y. | 1 | 74 | nw. |
| Block Island, R. I. | 1 | 64 | nw. | Do. | 3 | 54 | nw. |
| Do. | 28 | 53 | nw. | Do. | 21 | 58 | se. |
| Buffalo, N. Y. | 2 | 56 | w. | Do. | 22 | 63 | se. |
| Do. | 27 | 53 | w. | Do. | 28 | 52 | nw. |
| Cleveland, Ohio. | 11 | 54 | w. | Point Reyes Light, Cal. | 21 | 54 | se. |
| El Paso, Tex. | 17 | 55 | w. | Do. | 24 | 56 | nw. |
| Do. | 19 | 50 | sw. | Do. | 25 | 60 | nw. |
| Havre, Mont. | 6 | 50 | sw. | Do. | 28 | 72 | nw. |
| Mount Tamalpais, Cal. | 25 | 55 | nw. | | | | |

DESCRIPTION OF TABLES AND CHARTS.

By ALFRED J. HENRY, Professor of Meteorology.

For description of tables and charts see page 570 of REVIEW for December, 1901.